Replacement sheet

- Charge Pumping (CP) Setup
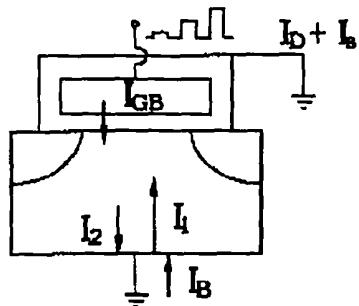
- $I_B = I_1 - I_2$
    = Recombination Current
    = CP Current (I_{CP})

- I_{GB} = Gate-Bulk Leakage

Fig. 1a

Replacement sheet

Increase V$_{gh}$

Local V$_{TH}$

Fix V$_{gl}$

Local V$_{fb}$

Equation for extraction N$_{it}$
$$I_{CP,max} = fqWLN_{it}$$

I$_{CP}$

I$_{CP,max}$ Normal CP Curve
(eg, t$_{ox}$>30A)

Leakage component

Abnormal CP Curve
(with AC leakage)
(eg, t$_{ox}$<20A)

V$_{gh}$

Fig. 1b

Replacement sheet

```
                        ( Start )
                           │
                           ▼
        ┌─────────────────────────────────────────┐
        │        Acquire a low leakage CP          │
        │          measurement window              │
        │ (suggestion let :I_B<10^{-12}~10^{-13})   │
        └─────────────────────────────────────────┘
                           │
                           ▼
        ┌─────────────────────────────────────────┐
        │      Fixed base level CP measurement     │
        └─────────────────────────────────────────┘
                           │
                           ▼                                ┌──────────────────┐
                        ╱────────╲           Yes           │  Remove leakage   │
                       ╱  With     ╲──────────────────────▶│ component by new  │
                       ╲  leakage  ╱                        │  CP methodology   │
                        ╲────────╱                          └──────────────────┘
                           │                                         │
                           │No                                       │
                           ▼                                         │
        ┌─────────────────────────────┐◀───────────────────────────┘
        │      Corrected CP curve      │
        └─────────────────────────────┘
                           │
                           ▼
                        ( End )
```
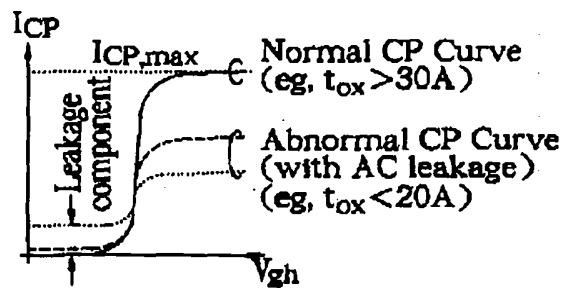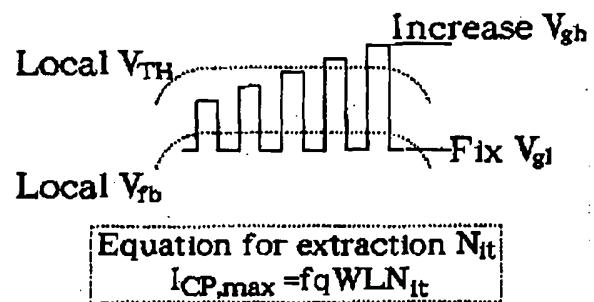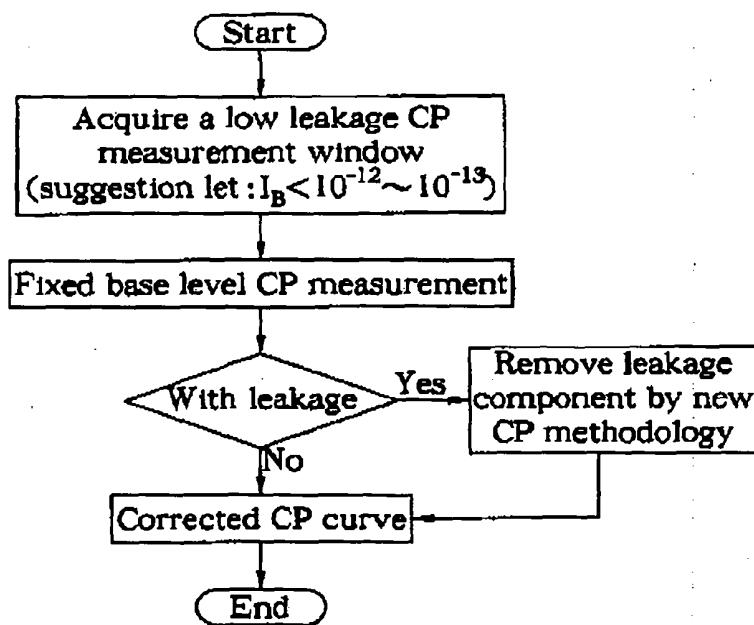
Fig. 1c
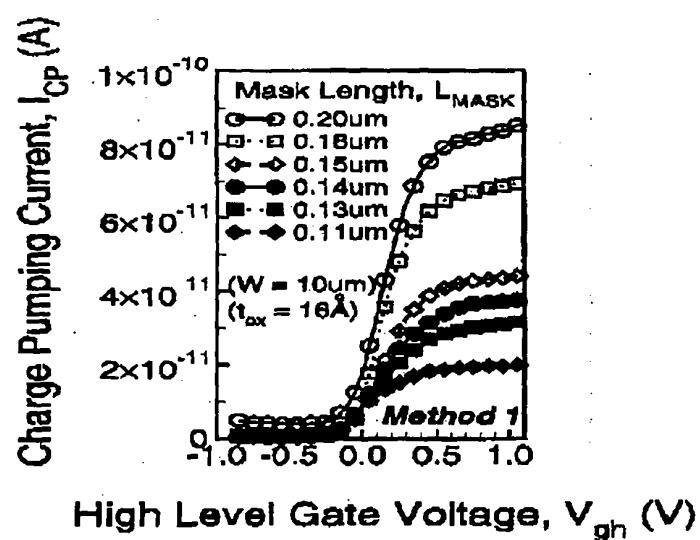
Replacement sheet

Fig. 3

Replacement sheet
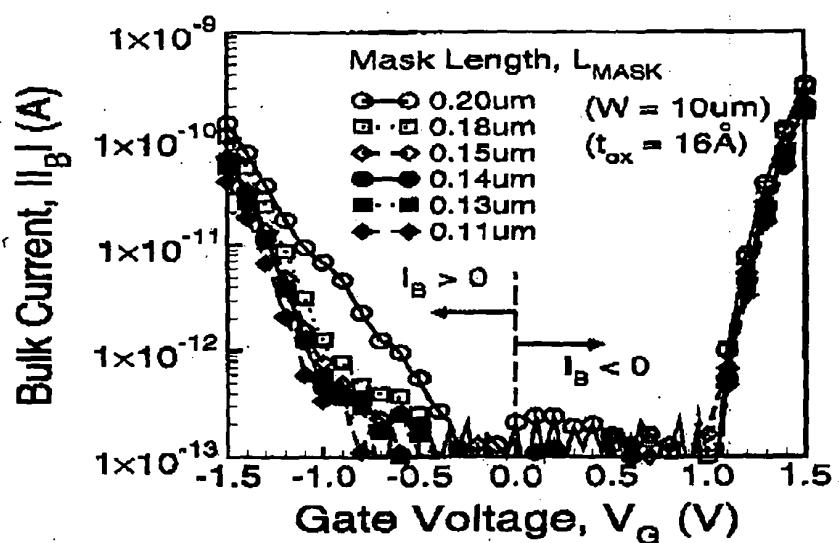

Fig. 4

Replacement sheet
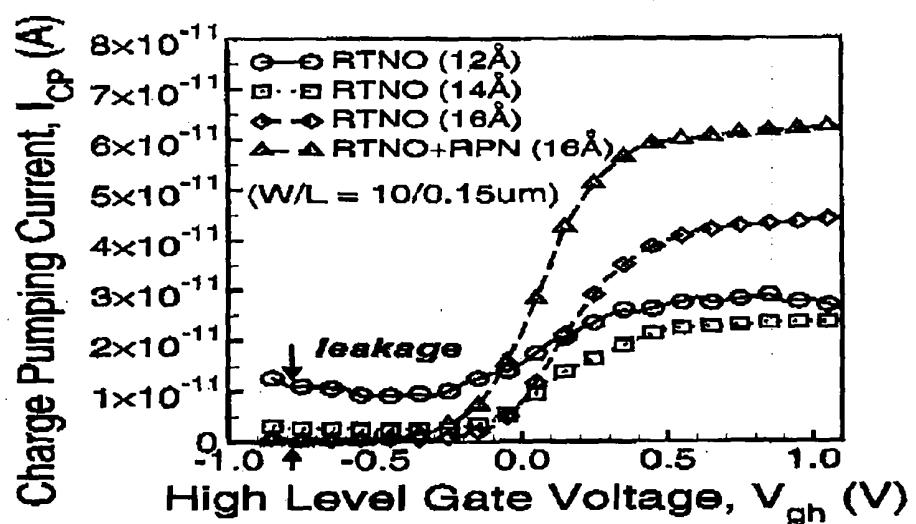

Fig. 5

Replacement sheet
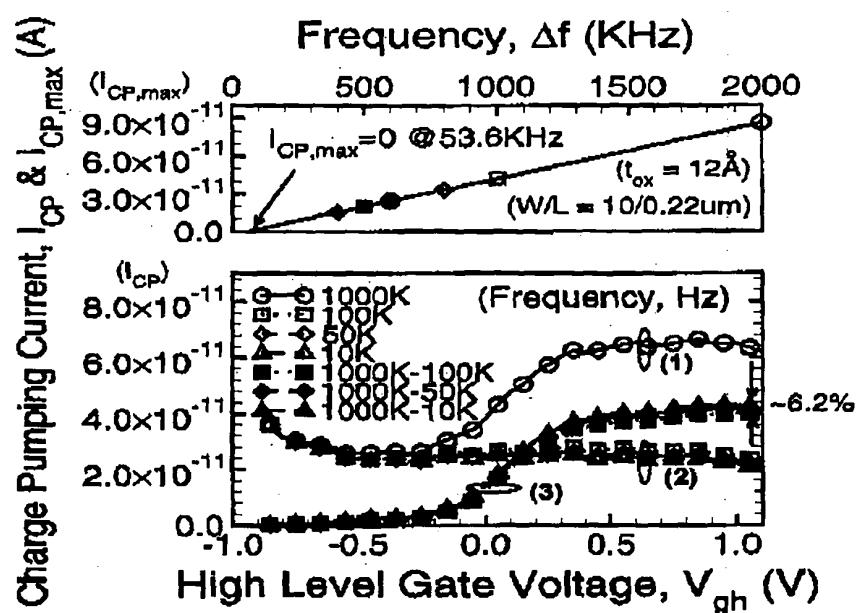

Fig. 6

Replacement sheet
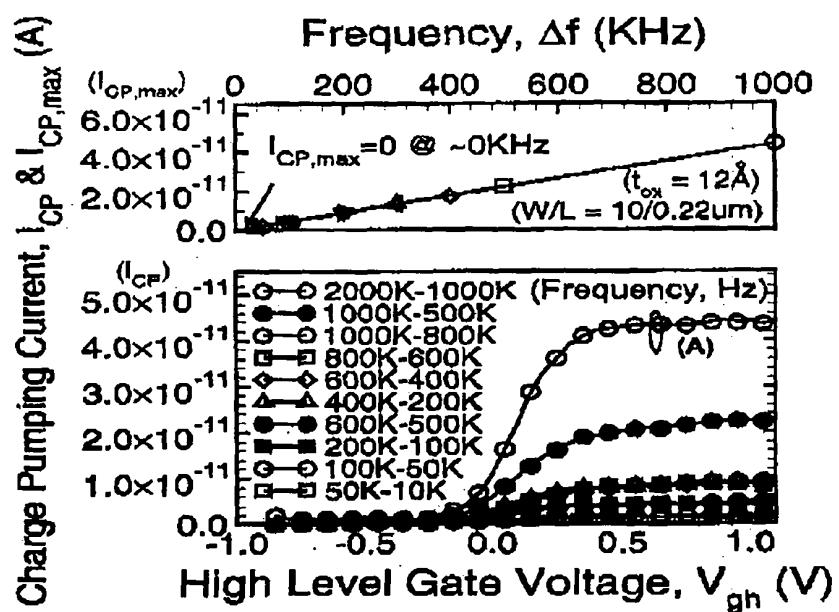
Fig. 7

Replacement sheet
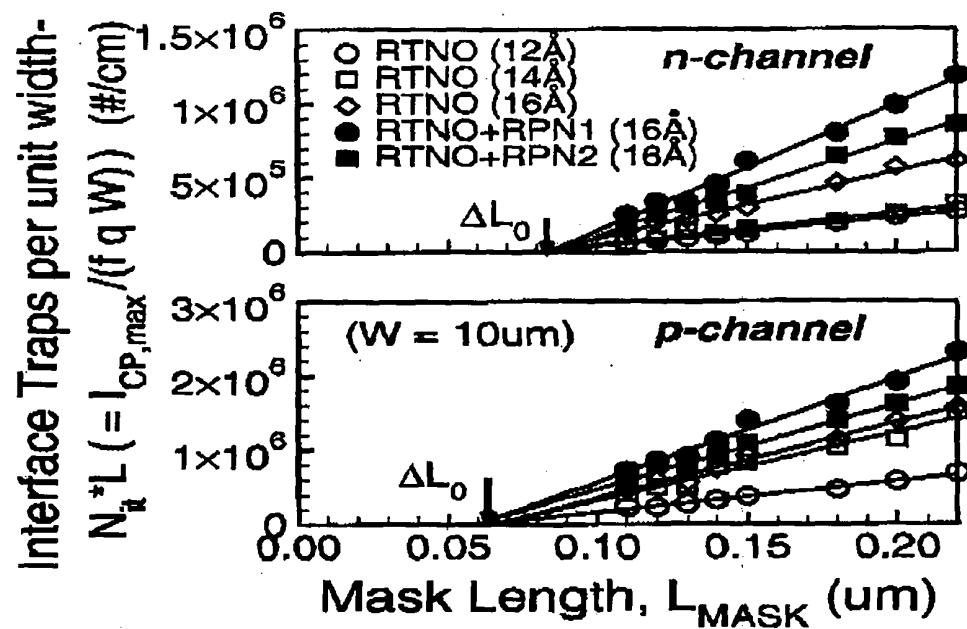
Fig. 9

Replacement sheet

(1a) $L_{MASK} = L_{gate} + 2 * \dfrac{\Delta L_1}{2} = L_{gate} + \Delta L_1$

(1b) $L_{gate} = L_{eff} + 2 * \dfrac{\Delta L_2}{2} = L_{eff} + \Delta L_2$

(1c) $\Delta L_0 = \Delta L_1 + \Delta L_2$

(2a) $N_{it,1,total} = N_{it,11} + N_{it,12}$

(2b) $N_{it,2,total} = N_{it,21} + N_{it,22}$

(2c) $\Delta I_{CP,max} \propto \Delta N_{it,total} = N_{it,1,total} - N_{it,2,total}$

$\quad = (N_{it,11} + N_{it,12}) - (N_{it,21} + N_{it,22})$

$\quad (\text{if } N_{it,11} = N_{it,21})$

$\quad = N_{it,12} - N_{it,22} \propto \Delta L$

Table 1

Fig. 10

Annotated sheet showing changes

Fig. 1c

Annotated sheet showing changes

High Level Gate Voltage, V_{gh} (V)
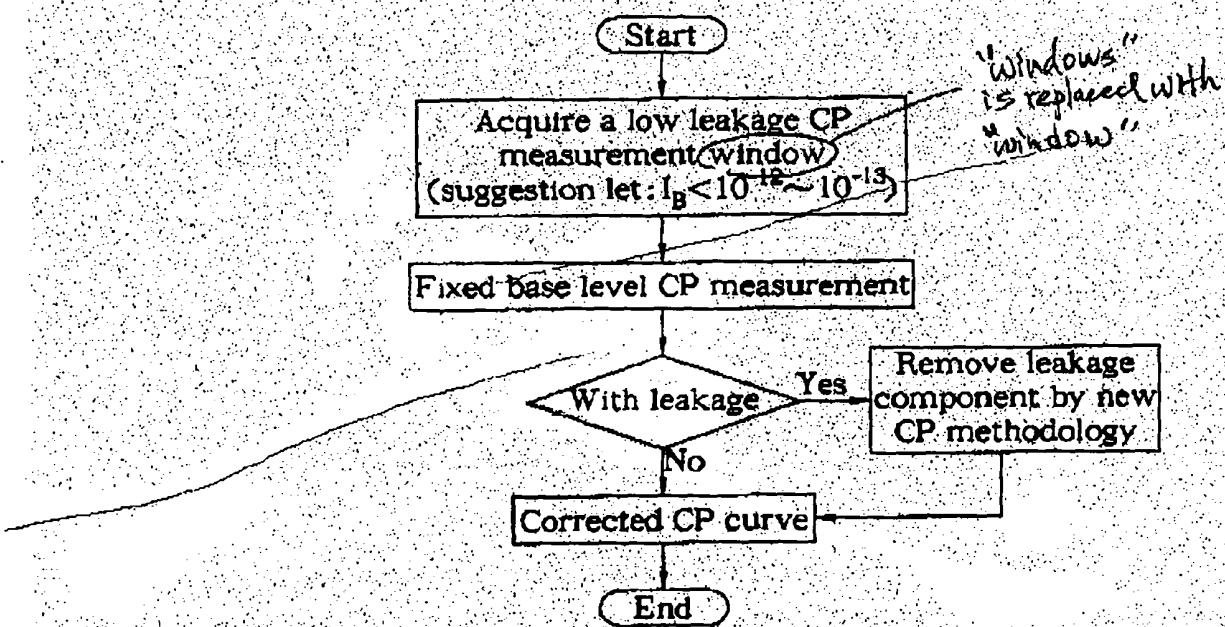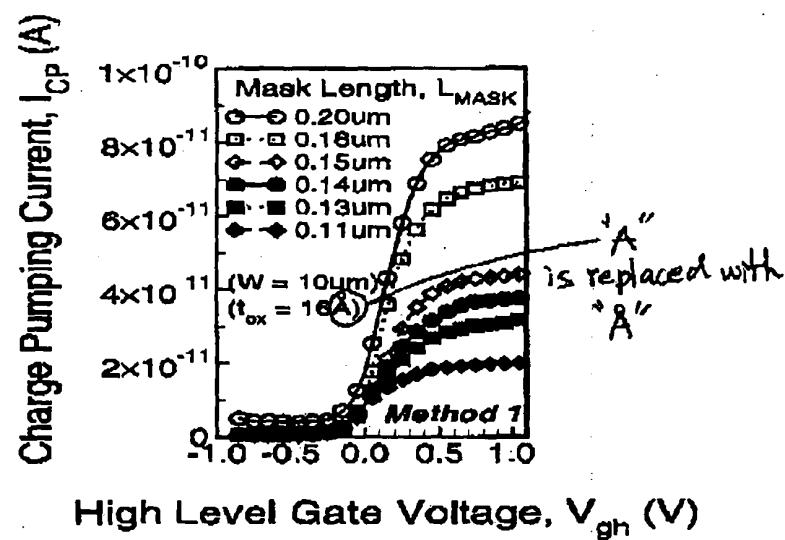
Fig. 3

Annotated sheet showing changes
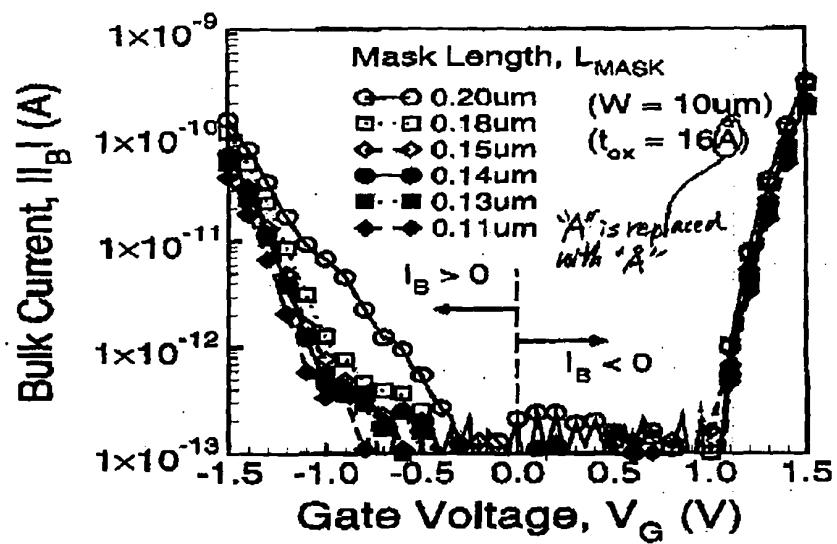
Fig. 4

Annotated sheet showing changes
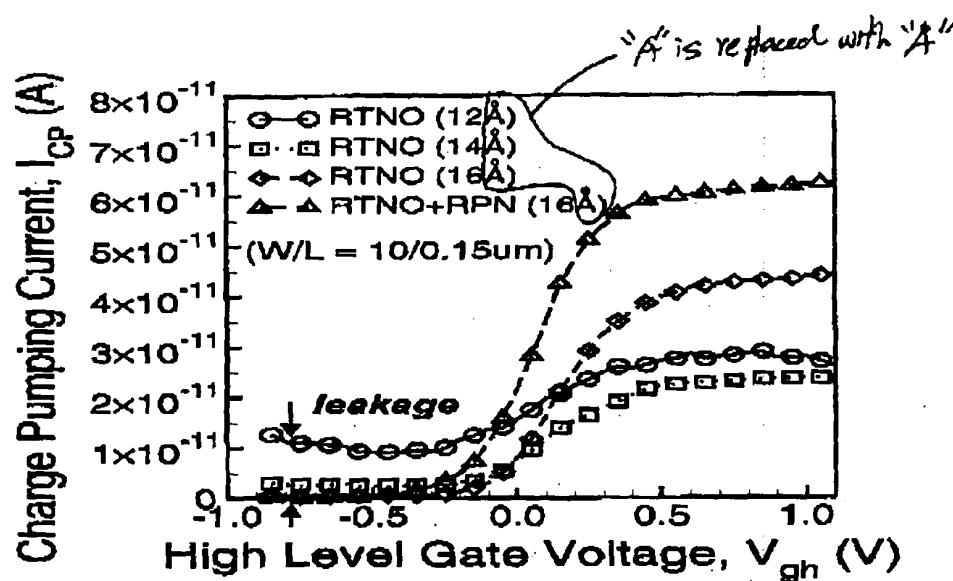
Fig. 5

Annotated sheet showing changes
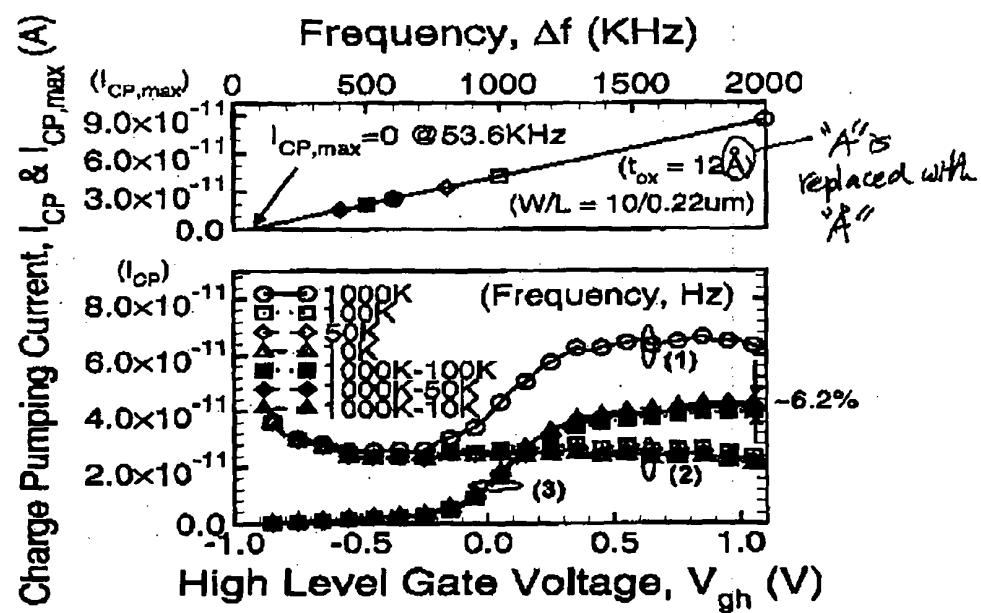
Fig. 6

Annotated sheet showing changes

Fig. 7

Annotated sheet showing changes

Fig. 9